CLAIMS

1. A fire door system, comprising:
a controller;
a rollable door;
an input drive for moving the door;
a clutch connected to the input drive and operatively connected to the controller.

2. The fire door system of claim 1, further comprising:
an axle supporting the rollable door;
at least one gear connected to the input drive; and
wherein the gear is rotatably connected to the axle yet fixable to the axle by the clutch.

3. The fire door system of claim 1, further comprising an axle driveably connected to the input drive and rollably supporting at least a portion of the door, the axle rollably receiving and feeding out sections of the rollable door.

4. The fire door system of claim 1, further comprising a position limit mechanism connected to the axle, the position limit mechanism registering the position of the door and feeding back data representing the position to the controller.

5. The fire door system of claim 1, wherein the input drive comprising a hand crank hoist connected to the axle for manually moving the door by operating the hand crank hoist.

6. The fire door system of claim 6, wherein the hand crank hoist has an engaged condition and a non-engaged condition, the system further comprising a hand crank sensor operatively connected to the controller and feeding back a signal to the controller indicating that the hand crank hoist is in at least one of the engaged and the non-engaged positions.

7. The fire door system of claim 1, further comprising a plurality of alarm modes.

8. The fire door system of claim 7, further comprising a hazardous environment sensor connected to the controller, wherein the hazardous environment sensor feeds a signal back to the controller when a hazard is detected in a space to which the fire door system is pertinent and the controller places the system in a first of the plurality of alarm modes.

9. The fire door system of claim 7, further comprising a clutch failure sensor connected to the clutch, wherein the clutch failure sensor feeds a signal back to the controller when the clutch fails and the controller places the system in a second of the plurality of alarm modes.

10. The fire door system of claim 7, wherein the controller and clutch are adapted to be connected to a primary power source, the system further comprising a primary power loss sensor connected to the controller, wherein the primary power loss sensor feeds back a signal to the controller when the primary power is lost and the controller places the system in a third of the plurality of alarm modes.

11. The fire door system of claim 7, further comprising:

a secondary power source connected to the controller and to the clutch;

a secondary power failure sensor connected to the controller; and

wherein the secondary power failure sensor feeds a signal back to the controller when the secondary power fails and the controller places the system in a fourth of the plurality of alarm modes.

12. The fire door system of claim 7, further comprising a safety sensor comprising one of an electrical, an optical, and an electro-mechanical device connected to the controller, wherein the safety sensor feeds a signal back to the controller when the safety sensor detects an obstruction in a path of the rollable door and the controller places the system in a fifth of the plurality of alarm modes.

13. The fire door system of claim 7, further comprising at least one audio alert connected to the controller, the audio alert being actuated when the alarm mode has been initiated.

14. The fire door system of claim 7, further comprising at least one visual alert connected to the controller, the visual alert being actuated when the alarm mode has been initiated.

15. The fire door system of claim 1, wherein the input drive further comprises a motor, the system further comprising a plurality of alarm modes.

16. The fire door system of claim 15, further comprising a motor failure sensor connected to the motor, wherein the motor failure sensor feeds a signal back to the controller when the motor fails and the controller places the system in a sixth of the plurality of alarm modes.

17. The fire door system of claim 15, further comprising a spring failure sensor connected to a line feed of the motor, wherein the spring failure sensor feeds a signal back to the controller when a load on the motor exceeds a predetermined maximum and the controller places the system in a seventh of the plurality of alarm modes.

18. The fire door system of claim 15, further comprising an interface device for positively controlling the door, the interface device comprising:

an open button for placing the door in a moving up mode;

a close button for placing the door in a moving down mode;

a stop button for placing the door in a stopped mode; and

wherein the stop button is a momentary switch that stops the door while the button is pressed and returns the system to the immediately previous mode when the stop button is released.

19. The fire door system of claim 1, further comprising a reset switch that is automatically actuated when the door reaches a fully opened position, wherein the reset switch sends a signal to the controller and changes a state of the system from an alarm mode to a regular operational mode.

20. The fire door system of claim 1, further comprising a manual alarm switch operatively connected to the controller and by which the system can be manually placed in a first alarm mode for testing the system.

21. A clutch for aiding in the movement of a fire door, wherein:

the clutch is adapted to be connected to a sprocket of a rollable door drive;

the clutch has an armature comprising at least one spring supporting a flex plate;

the armature is adapted to be connected to the axle;

the clutch has a rotor;

the rotor of the clutch is adapted to be supported on the sprocket;

a coil adapted to be supported within the rotor;

the coil induces a magnetic field to attract the flex plate to the rotor;

the armature has mounting structure for supporting the spring and flex plate on the axle; and

the rotor has fastening elements for supporting the rotor on the sprocket.

22. The clutch of claim 21, further comprising a plurality of diameter selectable friction rings at least two of which are fixed to the rotor and to the flex plate respectively, wherein the friction rings provide a clutch torque corresponding to a diameter of the friction rings.

23. A fire door movement control assembly, comprising:

a clutch connected to a sprocket and adapted to be connected to an axle of a rollable fire door drive, wherein the clutch has an armature comprising at least one spring supporting a flex plate and the armature is adapted to be supported on the axle;

the clutch having a rotor supported on the sprocket, wherein the rotor and the sprocket are adapted to be rotatably supported on the axle;

a coil adapted to be supported within the rotor, wherein the coil induces a magnetic field to attract the flex plate to the rotor;

armature mounting structure for supporting the spring and flex plate on the axle;

rotor fastening elements supporting the rotor on the sprocket; and

coil fastening elements for supporting the coil within the rotor independently of the rotor.

24. The door movement control assembly of claim 23, further comprising:

a friction plate mounted on the flex plate and extending radially outwardly from the flex plate;

a friction disc mounted on the rotor and extending radially outwardly from the rotor; and

wherein the friction plate and the friction disc engage each other when the clutch is engaged to inhibit relative motion between the flex plate and the rotor.

25. The door movement control assembly of claim 24, further comprising at least one spring supporting the friction plate on the flex plate and urging the friction plate into engagement with the friction disc when the clutch is not engaged in order to frictionally impede motion between the flex plate and the rotor when the clutch is not engaged.

26. The fire door movement control assembly of claim 23, wherein the armature mounting structure comprises a keyed sleeve.

27. The fire door movement control assembly of claim 23, wherein the rotor fastening elements fixedly attach the rotor coaxially to the sprocket.

28. The fire door movement control assembly of claim 23, further comprising an electronic controller operatively connected to the clutch.

29. The fire door movement control assembly of claim 28, further comprising a backup power supply operatively connected to the electronic controller and to the clutch.

30. The fire door movement control assembly of claim 28, further comprising an interface device operatively connected to the electronic controller for active input to the control assembly.

31. The fire door movement control assembly of claim 28, further comprising a rheostat connected to the electronic controller selectively determining a strength of adjustment of the clutch.

32. The fire door movement control assembly of claim 23, further comprising:
an electronic controller;
a mounting plate adapted for mounting the control assembly on a support structure of a fire door;
the mounting plate comprising:
a through opening adapted to receive the axle therethrough;
mounting plate fastening structure for mounting the mounting plate to the support structure of the fire door; and
a mounting platform, wherein the mounting platform supports the electronic controller and the electronic controller is operatively connected to the clutch.

33. The fire door movement control assembly of claim 32, wherein the coil fastening elements comprise standoffs supporting the coil on the mounting plate.

34. The fire door movement control assembly of claim 32, further comprising a backup power source supported on the mounting platform and operatively connected to the electronic controller and to the clutch.

35. A hand crank hoist for manually moving a fire door, the hand crank hoist comprising:

a hand crank axle;

a pulley mounted on a first end of the hand crank axle;

an endless element engaging the pulley;

a gear mounted on a second end of the hand crank axle;

a housing surrounding the pulley and adapted to support the hand crank hoist on a fire door support structure;

a bell crank mechanism pivotally mounted to the housing and engaged by the endless element;

at least one shoe selectively engaging a brake element of the hand crank axle;

a linkage connecting the shoe to the bell crank mechanism; and

wherein manually engaging and pulling on the endless element moves the bell crank mechanism, the bell crank mechanism moves the linkage, and the linkage moves the at least one shoe out of engagement with the brake element and releases the hand crank axle for free movement in response to further pulling of the endless element of the hand crank.

36. The hand crank hoist of claim 35, wherein the bell crank mechanism comprises at least one guide extending transversely to a first vertical line tangent to the pulley.

37. The hand crank hoist of claim 36, wherein the at least one guide is a first guide and the bell crank mechanism further comprises a second guide extending transversely to a second vertical line tangent to the pulley on an opposite side of the pulley from the first vertical line.

38. A method of controlling a fire door system, comprising the steps of:

controlling a fire door by an electronic controller; and

controlling the fire door by a clutch during alarm conditions.

39. A method of controlling a fire door system of claim 38, wherein:

the step of controlling the fire door by the electronic controller further comprises controlling a fire door by the electronic controller in both of alarm conditions and non-alarm conditions when the primary source is on;

the step of controlling the fire door by the clutch further comprises controlling the fire door by the clutch during alarm conditions when the primary power source is off; and

the method of controlling the fire door system further comprises controlling the fire door by a motor during alarm conditions when a primary power source is on.

40. The method of controlling a fire door system of claim 38, further comprising the steps of:

receiving a signal in the electronic controller indicating one of the alarm conditions; and

initiating a first audio and/or visual alert to inform persons of the alarm condition and to warn them that the fire door will be closing.

41. The method of controlling a fire door system of claim 40, further comprising the steps of:

waiting a first predetermined period of time;

beginning to close the fire door;

receiving a safety input signal in the electronic controller;

stopping the movement of the door by the controller; and

initiating a second audio and/or visual alert to advise persons of a safety condition corresponding to the safety input signal.

42. The method of controlling a fire door system of claim 41, wherein:

the safety input signal is an automatic signal provided by the controller;

the step of stopping comprises stopping the movement of the door at a position between a fully opened position and a fully closed position; and

the method further comprises delaying further closing of the door for a second predetermined period of time to enable disabled persons to egress before the door is completely closed.

43. The method of controlling a fire door system of claim 41, wherein:

the safety input signal is a signal from a sensor detecting an obstruction in a path of the door; and

the step of stopping further comprises inhibiting additional engagement of the door with the obstruction.

44. The method of controlling a fire door system of claim 43, further comprising:

moving the door in an opening direction a predetermined distance;

moving the door in a closing direction until the obstruction is detected again or until the door reaches a fully closed position; and

repeating the steps of moving the door in an opening direction and moving the door in a closing direction less than or equal to a predetermined number of times before leaving the door in a stopped condition when the obstruction is not removed from the path of the door.

45. The method of controlling a fire door system of claim 43, further comprising:

leaving the door in a stopped condition for a third predetermined time after the obstruction has been removed; and

continue closing the door when the third predetermined time has lapsed.

46. The method of controlling a fire door system of claim 41, further comprising:

finishing closing the door; and

initiating a third audio and/or a visual alert to inform persons that the door has been closed.

47. The method of controlling a fire door system of claim 38, further comprising

receiving a signal in the electronic controller indicating a loss of function in at least part of the system.

48. The method of controlling a fire door system of claim 47, wherein the step of receiving a signal comprises receiving a signal indicating a failure in a secondary power source, the method further comprising the steps of:

initiating a fourth audio and/or a visual alert;

waiting a fourth predetermined period of time after initiating the fourth audio and/or visual alert; and

initiating a secondary power source failure alarm condition in the electronic controller.

49. The method of controlling a fire door system of claim 47, wherein the step of receiving a signal comprises receiving a signal indicating a field breakdown in the clutch, the method further comprising the steps of:

initiating a fifth audio and/or a visual alert;

waiting a fifth predetermined period of time after initiating the fifth audio and/or visual alert; and

initiating a clutch field breakdown alarm condition in the electronic controller.

50. The method of controlling a fire door system of claim 47, wherein the step of receiving a signal comprises receiving a signal indicating a loss of primary power to the fire door system, the method further comprising:

waiting a sixth predetermined period of time;

checking to see if primary power has been restored; and

initiating a primary power loss alarm condition in the electronic controller.

51. The method of controlling a fire door system of claim 38, further comprising effecting a bumpless shift from primary power to secondary power.

52. The method of controlling a fire door system of claim 38, further comprising periodically checking for a loss of primary power.

53. The method of controlling a fire door system of claim 38, further comprising periodically checking for a failure in the secondary power source.

54. The method of controlling a fire door system of claim 38, further comprising the periodically checking for a field breakdown in the clutch.

55. The method of controlling a fire door system of claim 38, further comprising the step of resetting the electronic controller by opening the fire door to a fully open position, wherein the step of resetting the electronic controller comprises removing an alarm condition for subsequent regular non-alarm operation of the fire door system.

56. The method of controlling a fire door system of claim 38, further comprising the step of resetting the electronic controller by pressing a door opening button, pressing a clutch release button, or pulling a hand crank chain, wherein the step of resetting the electronic controller comprises removing an alarm condition for subsequent regular non-alarm operation of the fire door system.

57. The method of controlling a fire door system of claim 38, wherein the steps of controlling the fire door further comprise actively opening, closing, or stopping the fire door by pressing a button operatively connected to the electronic controller.

58. The method of controlling a fire door system of claim 38, further comprising: pulsating the clutch on and off to control descent of the fire door in increments; and

permitting the door to descend in increments corresponding to the pulsating of the clutch.

59. The method of controlling a fire door system of claim 38, further comprising the steps of:

receiving a signal in the electronic controller indicating one of the alarm conditions; and

initiating a time delay of a predetermined period of time before which the system cannot be reset.

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